

AN EXAMPLE OF A VERNONIA HYBRID IN A DISTURBED HABITAT

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The identification of ironweeds has been a persistent source of difficulty, resulting in large part from the blurring of species lines by hybridization. Cain (1944) suggested that hybridization in *Vernonia* increased with the arrival of European man who cut timber, built roads, drained land, and created numerous ecological niches not previously present. He presented the hypothesis that *Vernonia* \times *illinoensis* Gleas. was derived from hybridization and introgression of three species, *V. missurica* Raf., *V. fasciculata* Michx and *V. altissima* Nutt., and this hybridization was augmented by the disturbance of the habitat by man. A relationship between natural hybridization and disturbed habitats has been recognized for some time. Anderson's classic paper (1948) summarizes our present day concept of the habitat and its significance in natural hybridization. Anderson points out that hybrids often survive where man has disturbed or "hybridized" the habitat. Hybrid swarms are most often found in disturbed habitats, particularly those which are intermediate between the habitats of the parents and to which neither parent is as well adapted as are the hybrids.

In 1963, I found an interesting example of *Vernonia* in a disturbed habitat near Leakesville in Greene County, Mississippi. In the area concerned, *Vernonia altissima* grows along the edge of the wet, bottomland forest near the Chickasawhay River with many of the plants of the population growing in standing water. This population of *V. altissima* is not pure but apparently contains genes of *V. missurica* reflecting the introgression mentioned above. This does not, however, have any bearing on the problem at hand and to avoid confusion I will call this taxon *V. altissima*. Southeast of the river is a high, very dry, sandy turkey oak and longleaf pine ridge with *V. angustifolia*

abundant. Some years ago, a road with a long fill was constructed from the wet bottomland to the dry ridge (Fig. 1) and a hybrid swarm of several hundred clones representing both F_1 and backcross types can now be found on this fill. The ironweeds of this swarm are intermediate in morphological features and habitat requirements between the narrow leaved *V. angustifolia* and the wide leaved *V. altissima*. The roadfill evidently provides a number of ecological niches between the contrasting wet and dry sites resulting in a typical example of a "hybridized" habitat.

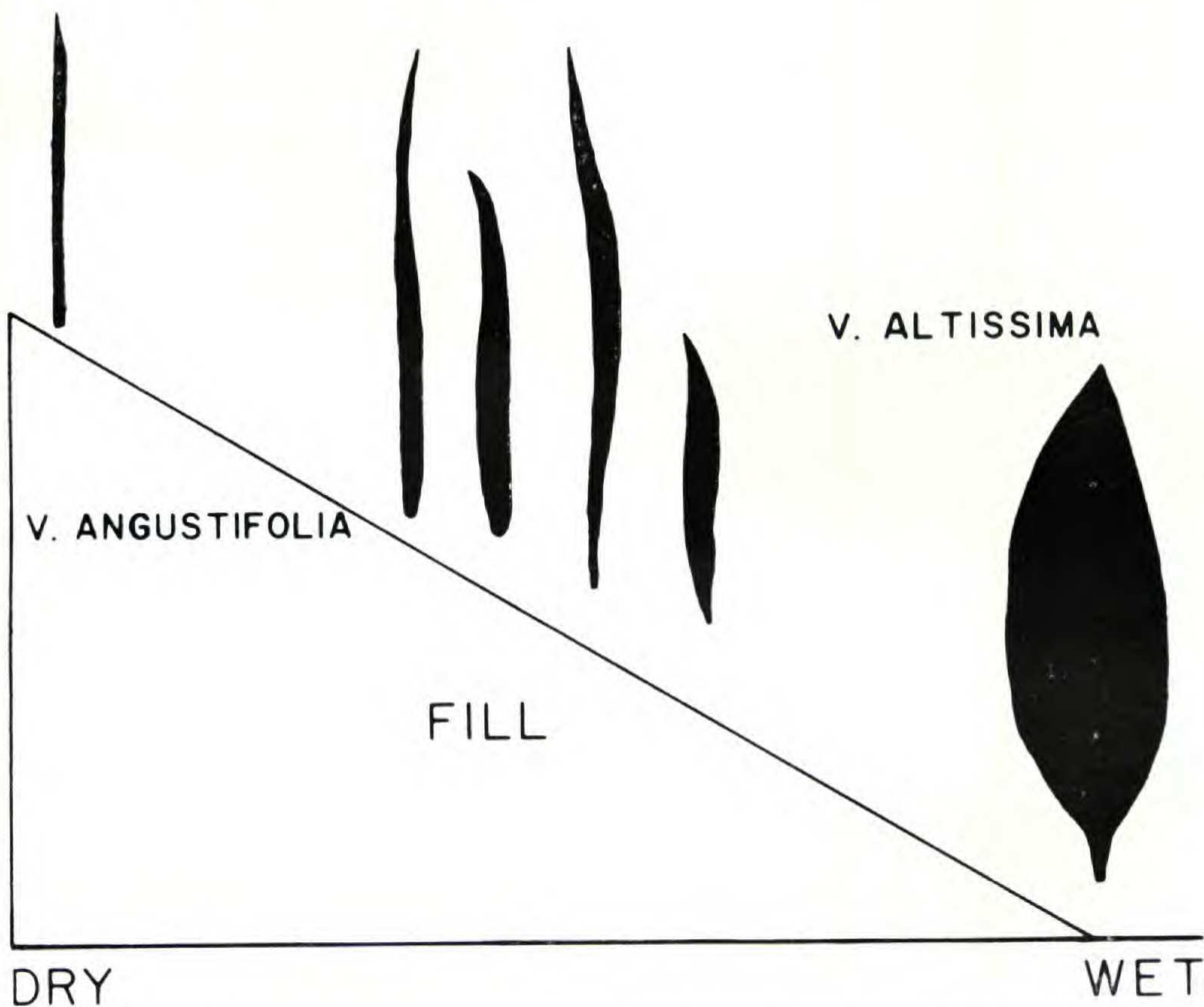


Fig. 1. Diagrammatic scheme of the habitats and leaf tracings of the parents and hybrids.

To assess the degree of interbreeding, local population samples of about 25 specimens each were collected from the two extreme habitats and along the roadfill in 1963, 1964, and 1966. In addition, individuals of the present species and selected hybrids were transplanted to the

experimental garden and greenhouse. That natural hybridization could be the cause of the intermediates was demonstrated by crossing *Vernonia altissima* and *V. angustifolia*. The artificial F_1 hybrids appeared to be vigorous and similar to the hybrids found on the fill. Backcrosses were also made between the field collected hybrids and the two parental species. Pollen stainability tests with anilin blue in lacto-phenol indicated that there was no appreciable difference in stainability between the two parental species, the natural hybrids, the backcross types, or the artificial F_1 hybrids. The average stainability ranged from 87 to 99 percent. The local population samples were measured and scored; the important morphological features are compared in Table 1. A scatter diagram is presented in Figure 2.

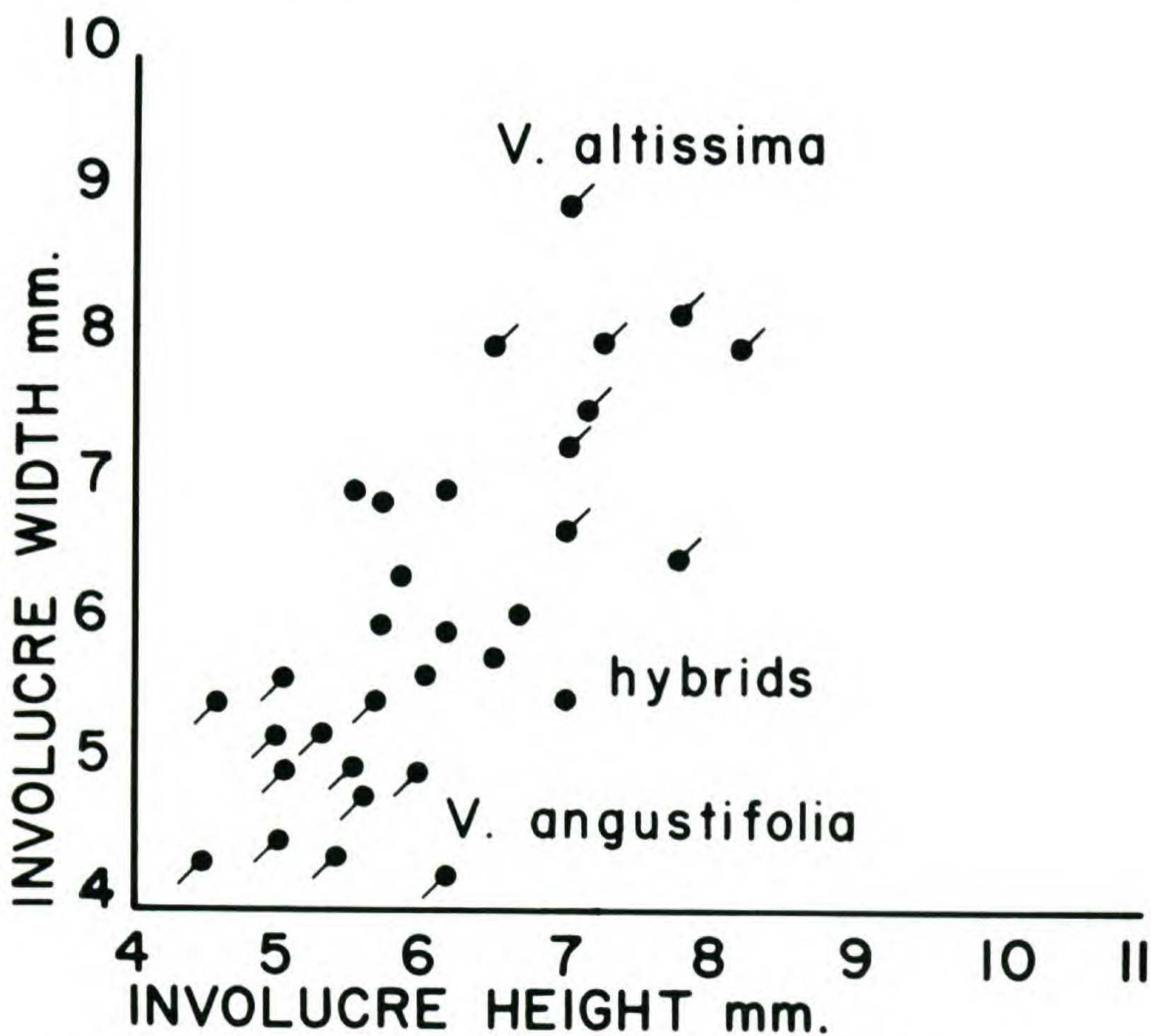


Fig. 2. Scatter diagram of *Vernonia altissima*, *V. angustifolia*, and their hybrids from local population sample.

TABLE 1. Comparison of certain morphological features of *Vernonia angustifolia*, *V. altissima* and their natural hybrids^a

Characteristic	<i>V. angustifolia</i>	Hybrids	<i>V. altissima</i>
Leaf Shape	linear	narrowly lanceolate	elliptic to elliptic-lanceolate
Leaf Surface (lower)	scabrous	scabrous to sparsely tomentose	sparsely short tomentose
Leaf Margins	callus teeth	remotely toothed	teeth present
Leaf Length	46 — 98 mm	75 — 137 mm	103 — 158 mm
Width	1.0 — 2.4 mm	3.7 — 10.6 mm	21 — 31 mm
Flowers/head	10 — 16	16 — 22	25 — 40
Involucre Width	4.2 — 6.0 mm	4.8 — 8.0 mm	6.1 — 9.0 mm
Involucre Height	4.7 — 6.2 mm	6.7 — 8.2 mm	5.5 — 7.8 mm
Involucre Shape	narrowly campanulate	campanulate	broadly campanulate
Bract Tips	acute to acuminate	mucronate to acute	mucronate

^aBased on studies of local population samples, see text.

Pollen size was determined by staining mature pollen grains with anilin blue in lacto-phenol and measuring them with an eyepiece micrometer. The sizes of the pollen grains are given in Table 2. The pollen grains of the hybrids were intermediate in size between those of the parents and had a greater standard deviation than those of the parents. Both taxa have a chromosome number of $n = 17$.

TABLE 2. Diameter of the pollen grains^a

Taxon	\bar{X}	Range	s
<i>V. angustifolia</i>	38.8	37.4 — 40.8	1.24
Hybrids	41.2	39.1 — 44.2	2.51
<i>V. altissima</i>	43.0	40.8 — 44.2	1.53

^a $n = 125$, from 5 plants of each taxon; measurements in microns.

The ranges of *Vernonia altissima* and *V. angustifolia* are partially sympatric. They are, however, usually ecologically isolated. The former grows in moist or even wet areas at the edge of low woods or in open fields, while the latter is found in well drained upland habitats such as scrub oak sand hills or dry longleaf pine woods. Studies based on the Greene County, Mississippi site clearly indicate that ecological isolation is not always effective and that the hybrids are intermediate between their parents in both morphological characteristics and in their habitat requirements. Introgression between *V. altissima* and *V. angustifolia* is certainly conceivable and may serve to enlarge the ecological parameters of those two taxa. I have observed this natural hybridization in scattered locations in both Alabama and Mississippi where the ranges of these two taxa are sympatric. At other sites, however, only one or two hybrids were noted. This is probably due to the lack of suitable ecological niches for the hybrids. Since hybridization has been observed at other locations, it is possible that introgression is occurring where the species are sympatric.

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LITERATURE CITED

- ANDERSON, E. 1948. Hybridization of the Habitat. *Evolution* 2: 1-9.
CAIN, S. A. 1944. *Foundations of Plant Geography*. Harper, N. Y.
556 p.

WOLFFIA IN NEW HAMPSHIRE. Two small additions to the flora of New Hampshire were discovered on 8 October 1967 when I stopped to investigate an unusual greenish coloration in the shallow water of a small roadside pond. I had visited this pond about a year previously but found no noteworthy plants there at that time. To my surprise I now discovered, growing in great profusion, two of our most diminutive flowering plants:

WOLFFIA COLUMBIANA Karsten. Profusely abundant. Forming, with *Wolffia punctata* Griseb. and *Lemna minor* L., a dense floating layer about the margins of a small pond near Cohas Brook; on the east side of Interstate Highway 93 approximately 2 miles north of the Manchester City Boundary. Manchester, Hillsborough County, New Hampshire. 8 October 1967, *Countryman* 1718.

WOLFFIA PUNCTATA Grisebach. Data as above except less abundant. *Countryman* 1719.

The pond was revisited on 4 November 1967 in company with Albion R. Hodgdon. The *Wolffia* was still plentiful at that date. We were able to collect nearly pure samples of both species of *Wolffia* by pouring a pail of the pond water through two graduated sieves (kitchen tea strainers). The coarser sieve held back *Lemna minor* and miscellaneous debris while the finer sieve was of such a size as to contain the *Wolffia*. In the samples so collected about 95% of the material was *W. columbiana*, the balance *W. punctata*.

Specimens of both species have been preserved in FAA in sealed glass ampoules (see Dore, W. G., *Canadian Field Naturalist* 1957, 71: 10-16) and deposited in the herbaria of the New England Botanical Club and the University of New Hampshire.

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